

THE ANNALS

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[SECOND SERIES.]

“ per litora spargite muscum,
Naiades, et circum vitreos considite fontes :
Pollice virgineo teneros hic carpite flores :
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas ;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo.”

N. Parthenii Giannettasii Ecl. 1.

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I.—*On some new Fossil Fish of the Carboniferous Period.*

By FREDERICK M'COY, M.G.S. & N.H.S.D. &c.*

M. AGASSIZ, besides the few carboniferous fish he has figured and described, gives a long list of manuscript names of fishes of this formation in the 3rd vol. of his 'Poissons Fossiles,' but being unaccompanied by any definitions or figures, it gives no information of the characters of the species, nor even secures their priority to the author; however, of the thirty unpublished species which he there names from the carboniferous limestone of Armagh, I have, through the kindness of Capt. Jones, R.N., M.P., been enabled to study the original specimens, and become well-acquainted with all except the *Cladacanthus paradoxus* and *Cricacanthus Jonesii*, of which I could learn nothing: admitting those twenty-eight then as already established, I can state that they are quite distinct from any of the following species.

I have great pleasure in acknowledging my obligations to Capt. Jones, not only for much valuable information on the fishes of this period, and access to his collections both in London and Dublin, but for the loan of many of the most interesting species described below, which I was thus enabled to draw and

* Read, and drawings of all the species exhibited, before the Cambridge Philosophical Society, June 5th, 1848.

examine at leisure. To Mr. Griffith of Dublin I am also indebted for the loan of some interesting forms from the lower carboniferous shales of Ireland. The Rev. W. Stokes of Caius College, Cambridge, allowed me to select a large suite of new and interesting forms from his Armagh collections, and having given me the opportunity of drawing and describing them, they were deposited in the collection of that University, whence I have also described a few species from the Derbyshire limestones collected by Mr. W. Hopkins, F.G.S. &c. To the Rev. Prof. Clark of Cambridge, and also to Mr. Anthony of Caius College, Cambridge, I am infinitely indebted for the use of their magnificent microscopes, and for the kindness with which they took the trouble to make microscopic sections for me of the new genera; without their most valuable aid I could not have presented the internal microscopic structure of those forms.

CÆLACANTHI.

Holoptychius (Ag.).

When we look to the large number of species of this genus now known in the old red sandstone, all characterized by thick, bony longitudinally plaited scales, and the largest of them having but small conical teeth, sulcated at the base, and then compare them with those large compressed teeth in the carboniferous shales, such as the *H. Hibberti* (Ag.), of which Prof. Owen formed his genus *Rhizodus*, and the nearly allied, if not identical, *H. Portlocki* (Ag.) of the Irish shales, with their associated large, thin, rotundo-quadrated scales having the minute reticulated structure of *Glyptolepis*, I think it would be desirable, instead of considering the genera *Holoptychius* and *Rhizodus* synonymous as they are now held, to retain both generic names, but restricting each to such forms as those above noticed. In this point of view the following is the only true *Holoptychius* I have yet seen from the carboniferous limestone.

Holoptychius Hopkinsii (M'Coy).

Sp. Char. Scales elongate, narrow, elliptically pointed, very thick, convex; exposed portion strongly enamelled, covered with numerous thick, rounded, slightly flexuous, anastomosing, longitudinal ridges; concealed smooth portion deeply bifurcate, generally bent laterally at a considerable angle with the exposed portion. Length of enamelled portion 6 lines, width 3 lines.

The thick, narrow form and strong longitudinal ridges of the surface distinguish this species easily from its congeners. It

abounds in some parts of the black impure beds intercalated between the carboniferous limestone and overlying shale of Derbyshire, from whence the specimens described were collected by W. Hopkins, Esq., who presented them, with a suite of fossils from that district, to the University collection at Cambridge. I have great pleasure in dedicating it to one who, as a mathematician, and as an observer in the field, has so materially advanced the science of geology.

Isodus leptognathus (M'Coy).

I provisionally apply the above name to a dentary bone of a Ganoid fish apparently allied to *Glyptolepis*. It is destitute of ornament, about 2 inches long and $3\frac{1}{2}$ lines deep at the broad end; it is slightly curved and tapers a little to a rounded extremity at the anterior end; the upper margin is minutely roughened and contains about thirty nearly equal teeth, nearly their own length apart, conical, about one line long and half a line wide at base; the upper portion is smooth and the base coarsely fluted as in *Rhizodus*, of which it also possesses the important internal character of the medullary cavity being conical and simple in the upper or smooth part of the tooth, and as it approaches the base abruptly branching into several root-like processes, one corresponding to each of the external flutings: from *Rhizodus* however the genus is distinct by the teeth being of nearly uniform size (not of *two* distinct sizes), and by the section of each tooth being circular instead of elliptical with cutting edges.

From the yellow sandstone shale of Moyheeland, Draperstown (Ireland).

(Col. Mr. Griffith at Dublin.)

Centroodus (M'Coy), n. g.

(Etym. κέντρον, *galli calcar*, and ὀδούς, *dens*.)

Gen. Char. Tooth simply conical, gradually tapering, slightly curved backwards, apex pointed, section circular throughout; medullary cavity large, conical, simple, so wide at base that the tooth is reduced to a thin edge; surface even, very finely striated longitudinally. Microscopic structure:—exceedingly fine calcigerous tubes radiating directly from the pulp-cavity towards the periphery, near which they terminate in numerous very minute calcigerous cells, beyond which is a narrow clear layer bounded by a definite dark line, outside of which is a coating of glass-like enamel, without perceptible organic structure under a power of 300 diameters.

Externally these teeth slightly resemble *Rhizodus* (Ow.), but

are distinguished by their circular section, and wide, *simple* pulp-cavity, which latter distinguishes it from nearly all palæozoic teeth except the old red sandstone genus *Cricodus* (Ag.), from which it is known by its more slender conical form, and wanting the strong longitudinal ridges of the surface, as well as possessing the distinctly defined enamel layer, which has all the appearance of having been secreted by a distinct organ, and is quite different from the condensed dentine which forms the false enamel of most fish-teeth.

Centrodus striatulus (M'Coy).

Sp. Char. Tooth about half an inch long and $1\frac{1}{2}$ line in diameter at base; conical, gradually tapering to the pointed apex, with a slight backward curve; about one-fifth of the surface towards the apex perfectly smooth; the remainder, under the lens, is minutely and irregularly striated longitudinally.

This remarkable tooth, the only species I as yet know of the genus, seems to present all the characters, external and microscopic, of a true Saurian reptile; and when we compare it with Herman von Meyer's genus *Pistosaurus*, for instance, of the Laineckerberg Muschelkalk and other allied Saurians, the resemblance is such as to caution geologists against laying too much stress on the supposed first appearance of reptiles in the magnesian limestone, when drawing a line which would separate this group from the palæozoic rocks below.

Common in the bituminous carboniferous shale of Carluke, Lanarkshire.

(Col. Cambridge University.)

Colonodus (M'Coy), n. g.

(Etym. κῶλον, *ilia*, and ὀδὸς, *dens*.)

Gen. Char. Tooth elongate-conic, very gradually tapering, section round near the base, becoming trigonal towards the apex; front even, sides impressed with short, alternating, transverse, wrinkle-like furrows; enamel-like surface smooth, highly polished, longitudinally marked with few, distant, minute impressed striæ; it terminates obliquely at the base, the edge being slightly notched or wrinkled; base forming a short, slightly dilated round disc, placed obliquely to the axis of the tooth, and extending farther behind than in front, truncated below and of a coarse osseous texture: medullary cavity about one-third the diameter of the tooth, cylindrical, from which, under the microscope, the flexuous, distant calcigerous tubes are seen to radiate directly to the surface, towards which they become gradually finer and closer.

This tooth is not unlike a bit of small intestine tied at the end,

being nearly cylindrical, smooth, glossy, and slightly wrinkled transversely along the sides. In general external character it approaches most to *Dendrodus* and *Rhizodus*, but is destitute of the longitudinal flutings towards the base, which are so intimately connected with the internal structure of those teeth; the *transverse* wrinkling of the sides is also a strong external difference. The fine longitudinal scratch-like striæ of the surface resemble what we see in the enamel of *Suchosaurus*, &c. It is its internal microscopic structure which most perfectly distinguishes it from its allies, for by its simplicity it is at once widely removed from *Dendrodus*; and from *Rhizodus*, which it most nearly approaches in structure, it is distinguished (besides the differences in external conformation) by the much greater coarseness of the calcigerous tubes, and the greater space of blastema separating them: the difference is still greater towards the exterior; for while, in *Rhizodus*, the coarse tubes of the dentine terminate abruptly near the surface, ending in a layer of minute calcigerous cells, from which the infinitely finer and closer, straight tubes forming the enamel-like surface take their origin; in *Colonodus* the loosely flexuous calcigerous tubes are four or five times their diameter apart, and as they approach the surface they gradually become finer, a little straighter, closer and more numerous; but there is no layer of cells, no abrupt line of separation between the coarse tubes of the body of the tooth and the fine ones of the surface. The simplicity of its microscopic structure, and the simple round base distinguish *Colonodus* from central cusps of *Cladodus* (Ag.).

Colonodus longidens (M'Coy).

As there is but one species yet known, it is not possible to separate clearly the specific from the generic characters. However, the specimen on which those observations have been made is an almost perfectly straight, cylindrical tooth, the apex being unfortunately wanting, but enough remains to show that towards the extremity the anterior face becomes flattened so as to give an obscurely trigonal section; there are two alternating rows on each side of about thirteen or fourteen short transverse furrows, forming between them obscure wrinkles; the whole surface to the naked eye seems smooth and highly polished, but under a low power the fine, impressed, rather distant longitudinal sulci become visible. The whole tooth seems directed backwards at a considerable angle from its round bony base, and the inferior termination of the enamel-like portion is therefore very oblique to the axis of the tooth, being considerably lower in front than behind, the edge seeming of considerable thickness from a sharp constriction being immediately under it all round, beneath which

again the osseous base thickens to form a little peltate mass. The length of the portion preserved is 10 lines, width at base 3 lines, broken extremity at the above length $1\frac{1}{2}$ line.

From the red carboniferous limestone of Armagh.
(Col. Capt. Jones, R.N., M.P.)

PLACODERMI.

I provisionally propose to establish a distinct family under the above name, to include those Ganoid fish of the palæozoic rocks having the head and body encased in a series of odd or central, and of subsymmetrical or lateral, bony, variously tuberculated plates of large size. It might probably include all the genera described by Agassiz in his 'Monog. du Syst. Dévon.' &c., under the title *Cephalaspides*, except *Cephalaspis*, to which that family-name might be retained, the other genera having no obvious affinity with it; in addition to these, the present group will conveniently embrace the genera *Bothriolepis*, *Asterolepis* and *Psammosteus*, which, although widely separated from the former by Agassiz and placed by him in his family of Cœlacanth, are so obviously and closely allied to some of them (e. g. *Chelyophorus*, *Cocosteus*, &c.), that they cannot be separated either by general appearance or any points of structure with which we are acquainted; while they differ, on the other hand, from the other *Cœlacanthi* by the body not being covered by imbricating scales. The teeth are conical and plicated at the base.

Osteoplax (M'Coy), n. g.

Gen. Char. Dermal plates large, flat, osseous, polygonal, with straight sides; surface irregularly and minutely wrinkled, with scattered pores. Microscopic structure:—vertical section showing large, distant, cylindrical, branched, vertical tubes (? Haversian canals) terminating in the pores of the surface; the spaces between these tubes containing numerous oval bone-cells, rather more than their own length apart, from each of which short radiating branches extend on all sides, about six to the length of a corpuscle. Horizontal section:—large, circular, distant openings of the vertical tubes, with numerous intervening minute, radiated, Purkinjean cells, the tubuli of which do not anastomose with those of the adjoining cells in either section. One species.

Osteoplax erosus (M'Coy).

Sp. Char. Bony plates 1 to 2 inches wide and about 1 line thick; edges square; surface with close, short, irregularly

flexuous smooth grooves visible to the naked eye, and with distant, irregularly scattered oval foramina.

The remarkable bony plates to which I have given the above name vary in the number of their sides and the amount of the angles at which they meet; but the sides are always straight, and the surfaces flat and of uniform thickness. It is clear, from their form, that they cannot belong to the head, but must be viewed as dermal bones, covering some part of the body of a mailed fish. Of known genera they can only be compared with *Psammosteus* of the old red sandstone, to one species of which, the *P. meandrinus* (Ag.), the resemblance is particularly close, but the ridges of the surface are smooth in the present species and crenulated in the former. The two genera are well-distinguished by the internal microscopic structure, *Psammosteus* being composed of horizontal layers of large irregular cells, while *Osteoplax* has well-developed radiated bone-corpuscles.

Not uncommon in the schists belonging to the base of the carboniferous series at Cultra, Hollywood, county Down, Ireland.
(Col. Cambridge University.)

Psammosteus granulatus (M'Coy).

Sp. Char. A thin, shagreen-like expansion closely covered with nearly uniform hemispherical smooth tubercles, less than half their diameter apart (two in the space of a line), the base of each surrounded by a circle of minute granules.

This is an irregular fragment of rough shagreen-like integument, measuring about $2\frac{1}{2}$ inches in length and $1\frac{1}{2}$ inch in width; it is exceedingly thin. The species is closely allied to the *Psammosteus arenatus* (Ag.) of the Riga old red sandstone, but is distinguished by the tubercles having no sort of linear arrangement, and the granules surrounding the base are proportionably larger and rounder, not seeming like stellular denticles as in that species.

The specimen is from the fine black shale of the yellow sandstone (or lowest portion of the carboniferous system) of Kesh, river Banagh, county Fermanagh, Ireland.

(Col. Mr. Griffith.)

Psammosteus vermicularis (M'Coy).

Sp. Char. Surface covered with very minute conical tubercles, about six in the space of a line, irregularly placed, but averaging their own diameter apart, isolated, or two, three or four confluent to form small, irregularly twisted, vermicular ridges; the sides of the ridges and base of the tubercles denticulated with angular radiations (as in *P. arenatus*).

The specimen described is a reniform, convex plate, rather more than half a line thick, 1 inch 9 lines long and 1 inch wide, most probably belonging to the side of the head; not exactly agreeing with any bone I know in shape, but most like an operculum. The under surface is smooth (except the nucleus), the outer surface closely sculptured as above-mentioned. This species has the crenulations of the *P. arenatus* (Ag.), but the irregular, minute, and frequently confluent granules of the *P. undulatus* (Ag.); it is most nearly allied to the latter species, but the asperities, besides being crenulated, are smaller, more irregular, and the confluent ones more twisted and vermicular. The minute microscopic structure resembles that of *Psammosteus* generally, that is, four or five dense horizontal layers at the surface, beneath which the substance is composed of large irregular cells, about half their diameter apart, but irregularly arranged in the blastema.

From the yellow sandstone shale of Fallaghloon, Maghera, Ireland.

(Col. Mr. Griffith at Dublin.)

Chelyophorus Griffithii (M'Coy).

The specimens to which I give this name consist of a small jaw-bone, resembling the glossohyal in shape, about $11\frac{1}{2}$ lines long, obtusely pointed at the anterior end, and gradually increasing to nearly 2 lines in depth towards the posterior extremity, which is abruptly acuminate or wedge-shaped; the upper edge shows seven or eight small, curved, smooth conical teeth, their length rather more than twice their width, and the distance between them rather greater than their length; the surface of the margin has three or four rows of slightly elongate, closely-placed tubercles; towards the middle and lower part of the bone the tubercles elongate into short ridges, arranged in lines, which meet at an angle of 45° along the middle of the side, the angle pointing backwards on the posterior half, and forwards on the anterior half, so as to have a confused rhombic space at the middle of the bone; all the ridges and tubercles are glossy, very closely placed, and finely crenulated at their margins. The second specimen is a bone probably from the side of the occiput, resembling the portions of *Chelyophorus Verneuli* (Ag.) in figs. 17 and 18. pl. 31a of Agassiz, Monog. Old Red, &c.; the granulation of the sculptured portion is rather more distinct, forming lengthened tubercles in one part and subparallel ridges in another, and all minutely crenulated on the sides. The sculpturing of the two specimens is identical in character, both with each other and with the old red *Chelyophori*, differing from the *C. Verneuli* principally in the crenulation of the side of the tubercles.

They are both from the lowest carboniferous shales of Cultra, Hollywood, county Down, Ireland.

(Col. Mr. Griffith at Dublin.)

Coccosteus? carbonarius (M'Coy).

Sp. Char. Mesial (ventral?) plate very narrow; sides converging at an acute angle, apex rounded; mesial keel obtusely rounded, height in the middle one-fourth of the width; surface closely covered with rounded polished tubercles, varying from one-fourth to one-half of a line in diameter (generally the latter), each surrounded at its base by a little, closely applied, milled, or radiatingly sulcated collar; the intervening flat space faintly striated, and generally traversed by a small, smooth ridge which winds irregularly between the more distant tubercles.

The character of the sculpturing determines the reference of this species to either *Coccosteus* or *Asterolepis*, but as no lozenge-shaped plate similar to the central inferior one of *Coccosteus* has yet been demonstrated in *Asterolepis*, I think the reference, with a mark of doubt, to *Coccosteus* is most correct, a view which is also strengthened by the small size of the tuberculation. The genus has not hitherto been found out of the old red sandstone. The specimen above described being perfect only at one end, might be taken for the pointed posterior extremity of the dorsal plate of a *Coccosteus*; but as there is no indication of the little fossa invariably found near the termination of the mesial keel of that plate, it most probably belongs to the under side of the body. The prominent circle at the base of the tubercles, like the spine-basis of a *Cidaris*, strongly reminds us of the *Asterolepis speciosa*, but the tuberculation is very much smaller. The inter-tubercular salient line or ridge does not occur in any *Pterichthys*, *Coccosteus* or *Asterolepis* I am acquainted with. A second specimen, a portion of a flat plate from some other part of the body, shows the same size of tubercles and style of ornament, but rather more crowded in some parts and with wider spaces in others; one or two of the tubercles also, instead of being smooth and polished, show a faint, flexuous radiating striation from the centre to the thickened milled base. The width of the ventral plate at $1\frac{1}{4}$ inch from the point is only 1 inch, the sides converging straight to the apex from this distance.

Both examples are from the carboniferous limestone of Armagh.

(Col. Capt. Jones, R.N., M.P.)

Asterolepis verrucosa (M'Coy).

Sp. Char. Surface of plates closely covered with prominent, oval,

conical tubercles, averaging from one-third to one-half of a line in diameter, and less than half their diameter apart, each radiatingly sulcated from the apex to the margin, the deep sulci forming between them usually fourteen strongly defined, rough ridges from the apex, each of which is again divided by a short sulcus at its base; tubercles abruptly defined from the flat surface on which they rest; intervening surface with minute radiating striæ.

The specimen examined of this, which is one of the rarest ichthyolites of the mountain limestone, is an irregular fragment about $1\frac{1}{4}$ inch long and 5 lines wide; it is impossible to suggest what part of the body it belonged to. The genus has not been recorded before in the carboniferous limestone.

From the same locality and in the same collection as the last.

[To be continued.]

II.—*Notice of a new species of Antrophyum.* By R. K. GREVILLE, LL.D. &c.*

[With a Plate.]

IN addition to the two new species of ferns (*Oleandra Sibbaldii* and *Grammitis blechnoides*) recently communicated to Professor Balfour by Dr. Sibbald from the island of Tahiti, I have now to submit the description of a third to the Botanical Society. The discovery of this plant is an additional proof how much remains to be done in an island where numerous collections have been made, but which is evidently still rich in undescribed productions. It is to be hoped that Dr. Sibbald will have an opportunity of revisiting Tahiti under more favourable circumstances, and that he will add largely to his collections, especially of ferns and mosses.

The interesting fern which forms the subject of this short notice belongs to *Antrophyum*, a genus having undivided, more or less lanceolate fronds, in which the sori form continuous grooved lines on the simply reticulate venation. *Antrophyum* is thus nearly allied to *Hemionitis*, from which, it must be confessed, it scarcely differs, except in the simplicity of the frond, for the grooved sorus is a somewhat variable character.

There is however another genus, *Polytanium* of Desvaux, which has been separated on, as it appears to me, more slender grounds. In that genus the sori are not reticulated, but form

* Read before the Botanical Society of Edinburgh, 11th May, 1848.